Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. In a combustion experiment, 8.0 mol of methane gas reacts completely in a 2.00 L container

containing excess oxygen gas in 3.2s. **(8 marks K/U)**

CH4(g) + 2O2(g) → CO2(g) + 2H2O(l)

a) Express the average rate of consumption of the methane in units of mol/(L•s). **(2)**

b) Express the average rate of consumption of the oxygen gas in units of mol/(L•s). **(2)**

c) Express the average rate of consumption of the carbon dioxide gas in units of mol/(L•s). **(2)**

d) Express the average rate of consumption of the water vapour in units of mol/(L•s). **(2)**

2. The following rates of reaction were obtained in three experiments with the reaction:

2 NO(g) + Cl2(g) → 2NOCl(g)­

|  |  |  |  |
| --- | --- | --- | --- |
| Expt | Initial [NO], M | Initial [Cl2], M | Rate of reaction (M s-1) |
| 1 | 0.0125 | 0.0255 | 2.27 x 10-5 |
| 2 | 0.0125 | 0.0510 | 4.55 x 10-5 |
| 3 | 0.0250 | 0.0255 | 9.08 x 10-5 |

What is the rate law expression (including k value) for this reaction? **(7 marks K/U)**

Order of NO = Expt 1,3 - [NO] doubles, rate quadruples - second order [NO]2

Order of Cl2 = Expt 1,2 - [Cl2] doubles, rate doubles - first order [Cl2]

Rate = k[NO]2[Cl2] looking at experiment 1

Mark break down for each question.

1.a - d

1 mark for calculation (work)

1 mark for correct answer.

2.

1 mark for correct experiment choice and calculation NO

1 mark correct answer NO

1 mark for correct experiment choice and calculation Cl2

1 mark correct answer Cl2

1 mark for k calculation

1 mark for correct answer

1 mark for the overall rate expression